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REVIEWS OF BOOKS.

The Unity of the Organism, or the Organismal Conception of Life. By W. E. RITTER. Two volumes. Richard G. Badger, Boston, 1919.—pp. 398, 408.

These volumes urge a conception of living things that is denominated *Organismalism,* as opposed to one characterized as *Elementalism.* The two views are thus contrasted on the first page: "According to the one the organism is explained by the substances or elements of which it is composed: while according to the other the substances or elements are explained by the organism." The obviously extreme form of 'Organismalism' set forth in the last clause is not however defended: the author's thesis is stated on page 24 as follows:

"The organism in its totality is as essential to an explanation of the elements as its elements are to an explanation of the organism."

In the author's opinion the theory and practice of a large proportion of the workers in biology are not in consonance with this thesis: it is his ambition "to clear the conception of the 'organism' taken alive and whole, of the vagueness that has hitherto enveloped it, and make it as clear, as serviceable and as indispensable to science as . . . any other fully accredited and unescapable biological entity" (vol. I, p. 25). Just how much concretely, does he mean by Organismalism, and how far will working biologists assent to the views presented? How far and on what grounds will there be dissent?

Much of the work is devoted to criticism of Elementalism, and the entire presentation is mingled with discussions, largely polemical, of matters relating to the method and object of science. Here we attempt only to disengage and comment on the positive contentions in support of Organismalism, arranging them in a partially graded series of more or less independent propositions.

1. The parts of the organism work together to produce unified results: they are integrated in their action. The larger part of the work is a *resumé* of the concrete facts that demonstrate this to be true: the author goes in some detail over embryological development, the chemistry of the organism, protoplasm, cells, anatomy, and genetics, displaying throughout the working together of all parts to produce an organic unity, the living organism or individual.

It appears to the reviewer that all this must be, and is, admitted by all enlightened students of biology, including those that Ritter classes as elementalists: Loeb himself, the arch-elementalist, has written a book on the Organism as a Whole, in which many of these correlations of parts are set forth. It is a familiar observational fact that the muscles, nerves, and skeletal parts are so constituted, and work so together, as usually to move the body as a unit, all parts facilitating movement of a particular sort or in a particular direction. As Ritter shows in detail, parallel statements can be correctly made for all the different systems, not only when each is taken by itself, but when all are taken together: they tend on the whole toward a unified result. It is true that one cannot 'explain' them completely unless he takes note of that fact, if to 'explain completely' means to know a thing in its relation to the rest of the universe: these are demonstrable relations.

Ritter's condensed review of this field is of great value: I know of no attempt to make so complete a picture of the integrated interrelations of all parts, and particularly of the relations of the different systems to each other, making use of the modern researches in all these fields. Particularly suggestive are the discussions of the Protozoa in comparison with the Metazoa; and of chemical integration. The account is however not presented in a simple objective way, as a picture emerging of itself from the joint and several researches of workers in all fields of biology, as would appear most fitting and natural to the reviewer, but is largely admixed with criticism and condemnation of the investigators that have made the picture possible.

2. But Ritter is not satisfied with the proposition that the parts are coördinated in their activity; this is admitted by the merest elementalist. In advancing beyond this, he bases himself on the principle (sometimes called the principle of creative results) that in the organism, as in all chemical compounds, the components when united, or organized, produce something that did not exist in the parts taken separately, that could not be predicted from knowledge of these parts, nor known in any way except by observing that they actually occur in the combination. Like alcohol or water, an organism has characteristics which its components have not. Ritter applies this principle through all gradations: union of elements to form compounds yields new characteristics; union of compounds to form cells yields new characteristics, and so of union of cells to form organs, and all the way

up to the complete organism, which has characteristics not existing in any of its parts: it is an 'objective entity' not found in the components.

This general principle is I believe rather generally admitted for chemical compounds; at least all must admit that it holds practically, in the sense that the characteristics of compounds cannot as a matter of present fact be predicted or deduced from a knowledge of the components taken separately. Its extension to the higher grades of organization in organisms will doubtless arouse some question; to the reviewer, however, this extension appears logical and in consonance with observation.

3. Among the new characteristics thus appearing in the organism are those denominated conscious, the psychic. This appears to the reviewer, as to Ritter, a statement of fact, requiring recognition; a growing proportion of biologists—perhaps practically all that have devoted thought to the matter—would assent to it: consciousness and its differentiations are properties of the organism on the same footing in this respect as the distinctive properties of chemical compounds. Where there is dissent, it appears based on considerations extraneous to the observational study of biology.

Ritter discusses extensively consciousness and its differentiations in relation to the rest of the organism, discarding 'parallelism' as inadequate; he sets forth in his last chapters (likewise published as a separate work), in accordance with the above, what he calls 'An Organismal Theory of Consciousness.' This is formulated as follows:

"All the manifestations which in the aggregate we call Life, from those presented by the simplest plants to those of a consciously psychical nature presented by man and numerous other animals, result from the chemical reaction between the organism and the respiratory gases they take, oxygen being almost certainly the effective gas for nearly all animals. An essential implication of this proposition is that every living individual organism has the value. chemically speaking, of an elementary chemical substance" (II, p. 286).

Many pages are devoted to argument for the two propositions embodied in these two sentences. Oxygen is held to play some special part, diverse from that of other simple chemicals, in producing consciousness. This coincides with the experimental fact that exclusion of oxygen at once abolishes consciousness; but as having any farther significance the reviewer has not found the argument particularly illuminating. The proposition in the second sentence of the above formulation is dealt with in connection with our next subdivision.

4. Logically subordinate, but important in his scheme, is Ritter's argument for the diversity of all organic individuals. Here are summarized facts as to the objective diversity, when carefully examined, of all individuals even of the same species: Ritter brings this into relation with the subjective non-identity of conscious individuals.

To all this great importance is attached; the unified entity resulting from the organization of the components is as diverse in every individual from that in all others as any chemical compound is from any other; each individual is as it were a different chemical.

The objective diversity, in somewhat this sense, of the individuals of higher organisms is I believe supported by observation and experiment, save perhaps in the cases of 'identical twins.' In lower organisms cases of this latter sort are however very numerous.

In his argument for the proposition in the last sentence of his formulation of the Organismal Theory of Consciousness, quoted above, Ritter maintains that since each individual is thus chemically diverse from any other, its reactions with the respiratory gases must produce consciousness diverse from that of any other: the consciousness of each is, as one might say, a different kind of thing from that of any other.

Students of biology that have not pursued this train of thought may be repelled by its conclusions. But I do not see that anything in observational biology negatives them, and if the 'principle of creative results' is accepted, it leads to these views.

5. That which results from the organized totality of the parts, but is not in any of the parts taken separately, "having characters wholly of its own" (I, p. 18), is precisely what we know as an individual, a person in the case of man: it is an "objective entity" known to us by observation: it is a simple unit: a single thing. Of this entity many further assertions are made, and it is in connection with these that other workers in biology will be most inclined to scent danger, to raise questions and to express dissent. "The entire organism . . . represented by the highest animals, especially man, is the *supreme* unity" (I, p. 26); the parts are "subordinate to the organisms" (I, p. 297); "subject to the organism" (I, p. 307); the organism presses "into service" certain of its parts (I, p. 190); it has "needs and abilities" (I, p. 48); "the muscle cells are *used by* the

living being for its needs" (I, p. 294); there is a "causal power of the whole organism over its parts" (I, p. 49); it "dominates" cell formation (I, p. 195); the organism "had also endowed" the cells with ability to contract (I, p. 295); the individual is "ultimate both as to structure and as to causal power" (II, p. 149); etc. etc.

One might get the impression from these and other passages (see particularly the note, p. 82, vol. I) that the organism is held to be separable from and set over against the parts, but this is not meant; it is elsewhere rejected emphatically (II, p. 149). The grounds for attributing to the organism-as-a-whole causal power over its parts are: (1) "Since each individual is to some extent different from every other, and maintains its individuality in full possession of these differences by its power of transforming foreign substance into its own substance, it is ultimate both as to structure and as to causal power in as deep and literal a sense as the material particles of which it is composed are ultimate" (II, p. 149; here Ritter alludes to what are commonly known as heredity and the power of assimilation); (2) The parts when organized into the organism-as-a-whole act diversely from the way they would if not thus organized; for experimentally doing away with this organization but leaving the parts induces diverse action. In these senses then the organism 'endows' its parts with their specific abilities, for without it they would not have these abilities; in these senses it 'dominates' them, they are 'subject' to it. Ritter holds that these things ought to be explicitly recognized and made use of in the work of science; he visits heavy condemnation on those that neglect them.

How would this alter current practice in science? Suppose we inquire why one organism moves in a certain manner, another in a diverse manner. This might be attributed, with Ritter, to the fact that the two organisms as unified entities are diverse; each is "ultimate in causal power." In current practice what would be done would be to attempt to discover, by analytical experimentation, what diversities in the components, and in the relations of the components, bring about this difference; by altering the components and their relations this can commonly be done. An organism that moves toward the light might thus be found to differ from one that does not in a certain disposition of light-sensitive substances; when this is altered, it no longer moves toward the light. The diverse action in the two cases would then be attributed to these particular diversities in the components and their relations; this attribution can be verified experimentally as often as desired.

This could all be brought into unison with Ritter's demands by asserting that when the arrangement of substances is altered, the organism-as-a-whole is altered, and that this still dominates the course of action. But the diversity of the components or of their relations is still, though now at one remove, the cause of the diversity of action which was the starting point of the investigation. The question is, whether there is any advantage in intercalating the organism-as-a-whole as a step between the alteration in the relation of parts on the one hand and the consequent alteration on the other. To this I believe most workers in biology will answer that, while it may be edifying to realize, once for all, that diversity of components or of relation of components, results in diversity of the organism-as-a-whole, it is not as a rule worth while, nor practicable, to mention this in the presentation of experimental work or of causal research; that, truth though it may be, it adds little or nothing to the insight into any particular case of experimentally discovered relations. Certainly it would be intolerable for writer and reader if the organism-as-a-whole as determiner must be mentioned at every point where it truly is such, if we accept Ritter's point of view. In any concrete case whatever, it appears to me that any attribution of a phenomenon to the organism-as-a-whole as cause would have to be followed by attempts to discover how it happens that the organism-as-a-whole is of such a character as to yield this particular result; this would lead at once to study of the components and their relations; and it would be the experimental relations discovered between these and the final result that would constitute the meat of the discovery. To attempt to supplant this sort of investigation by final attribution to the organism-as-a-whole as cause is to shut off what constitutes the substance of science; it is refusal to be stopped by ultimate entities that gives us scientific knowledge. If we are not to stop at such attribution, it appears to play little or no part in our work.

How then are we to understand the assertions that the organism is *supreme,* that its causal power is *ultimate,* and the like? The reviewer finds it difficult to attach an experimental or observational meaning to these characterizations. 'Ultimate' the organism-as-a-whole is not in any experimental sense: what it is observationally and how it acts are determined by the nature of its components and the way they are put together. In reproduction it has been discovered that the materials of the two parts, egg and sperm, that by their union make the beginning of the new individual, may be sorted and combined in various ways, giving in each case individuals diverse in 'causal power,' so that out of the same two sets of materials many individuals, diverse in their characteristics and behavior, may be formed; the dependence of the characteristics and behavior of the individual on the distribution and combination of these substances has been demonstrated in hundreds of different ways. These distributions and recombinations have been found to follow the rules of permutations and combinations commonly denominated chance: they constitute the rules of inheritance discovered in the last few years. When from the same pair of parents are produced progeny, some with red eyes, some with white, shall we say that the diverse colors are due to the different individualities of the two sets, or to the fact that one has received the chemicals ('genes') required for producing the red color, while the other has not? The same question arises when part of the progeny fly toward the light, while the other do not; the distribution and number in each case following the general rules of inheritance of the 'genes.' I am inclined to believe that in practice science will continue to remain elementalist to the extent of preferring the latter method of accounting for the facts. This will not imply any denial of the existence of the unified organism (as it appears to me in spite of Ritter's criticisms on this point that most present practice does not). It means simply that the organism as cause is not ultimate, but like other conditions, has other causes back of it, and that discovery of these gives more insight than the statement that the organism-as-a-whole is the cause of what happens.

It is further certainly not true that the organism is supreme or ultimate in the sense that it causes all to occur in the interest of organic unity. The parts often operate in such a way as to prevent or destroy the existence of a unified individual: devastatingly disordered growth occurs in cancer; the organism frequently takes into itself substances that are incompatible with its unified action or even with its existence; it gradually admits such changes in its substance that it must die. In that sorting over and recombination of the numerous diverse chemicals at reproduction, to which we have before alluded, combination of components frequently occur that cannot produce normal and unified individuals; monstrosities and all sorts of non-viable individuals occur: plants without chlorophyll, condemned to death as soon as the parental food is exhausted; individuals that cannot produce legs, or wings, or eyes, or still more essential parts, so that they cannot make more than the beginning of development; individuals with supernumerary parts, parts so located that they cannot function, parts uncoördinated; bodies doubled, etc. Where appears the supremacy, the ultimateness of the individual, in these phenomena?

These facts as to the dependence of the characteristics of the individual on its components and on the way they are combined, and the production of non-unified, monstrous, non-viable individuals by many of the combinations formed, fit most awkwardly into a theory of the thoroughgoing unity, supremacy and ultimate causal power of the organism-as-a-whole, and it is perhaps not unintelligible that Ritter conducts a campaign against 'genetics,' which has brought these facts to light. Although he does not deny the facts briefly summarized above, he recognizes them grudgingly and he charges that "this [elementalist] philosophy more than the intrinsic importance of the objective discoveries is what has aroused the imagination and enthusiasm and stimulated the activity of geneticists" (I, p. 20). Twenty-five years ago our knowledge of the laws of heredity was recognized as practically zero; in no field was absence of scientific knowledge more painfully felt. The discovery of the proper method of bringing that immensely important field into science would appear amply sufficient to account for the arousing of enthusiasm and the stimulation of activity, whatever the theoretical bearing of the facts discovered. When a theory finds certain of the established facts unwelcome, it is an indication of the inadequacy of the theory.

Ritter's attitude toward genetics appears somewhat typical of his attitude toward many lines of work not his own; it is perhaps worth while to look into it a moment. Here as elsewhere the book appears to suffer seriously from a failure to grasp clearly the experimental point of view. The extended discussion of genetics is largely devoted to an attack on the theory that the chromosomes alone constitute the "material of inheritance"; that they are "the bearers of the hereditary qualities"; a theory that may be incorrect, but one the content of which appears to the reviewer so totally misapprehended by Ritter that his arguments have no bearing upon it. The theory means, in the minds of geneticists that support it as well of those that oppose it, that the chromosomes alone contain the substances by the diversities and recombinations of which diverse hereditary characteristics are produced in the different offspring,—while the remainder of the cell, indispensable though it be, plays a part similar to the food, water and other necessary conditions of the environment: diversities in it are held not to produce hereditary diversities in the offspring. Whether the theory is correct or not is a purely experimental question; certainly the evidence for it is very strong for most organisms. Ritter's argument consists in setting forth in great length and detail the fact that the cytoplasm takes part in the formation of all the structures produced; a fact of course familiar to all students of genetics, but having no bearing on what they mean by the theory that the chromosomes are the bearers of the hereditary qualities. It might be argued of course that in meaning this they misuse words, but it is a pity to mistake difference of opinion as to linguistic fitness for one as to the facts of inheritance. To the reviewer the critical and condemnatory parts of these volumes appear much less valuable than the expository and constructive portions.

In sum, the reviewer anticipates that many biologists will be found friendly to the propositions set forth in our subdivisions 1 to 4, but that there will be much dissent as to the value of many of the matters set forth under 5; and that there is little likelihood of any considerable change in scientific procedure in view of the points made.

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Studies in Human Nature. By J. B. Baillie. London, G. Bell and Sons, 1921.—pp. xii, 296.

This book by the Professor of Logic and Metaphysics at the University of Aberdeen is made up of an Introduction and nine 'Studies' or essays with the following titles: (I) Anthropomorphism and Truth; (II) The Realistic Character of Knowledge; (III) Certain Non-Logical Factors in the Process of Knowledge; (IV) The Nature of Memory-Knowledge; (V) The Function of Emotion in the Consciousness of the Real; (VI) The Significance of Philosophical Scepticism; (VII) The Place of Philosophy in Human Nature; (VIII) Science and the Humanities; (IX) Laughter and Tears: The Sense of Incongruity.

The philosophical standpoint from which the book is written is indicated in a general way by the title of the book and by certain statements in the preface. "It is not the purpose of these papers," the author writes, "to defend or support any of the familiarly accepted theories, whether of idealism or realism. Human nature is far